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ORIGINAL/ORIGINAL

CMD: 23-M27

Date signed/Signé le: 8 JUNE 2023

Mid-Term Report Presentation

Présentation du rapport de mi-parcours

Bruce Power Mid-Term Update of Licensed Activities

Rapport de mi-parcours au sujet des activités autorisées de Bruce Power

Public Meeting

Réunion publique

Scheduled for:
20–21 September 2023

Prévue pour :
20-21 septembre 2023

Submitted by:
CNSC Staff

Soumis par :
Le personnel de la CCSN

Summary

This Executive Summary provides the Commission with background information regarding Commission member document (CMD) 23-M27, *Bruce Power Mid-term Update of Licensed Activities* [1].

CMD 23-M27 [1] provides the Commission with information on the CNSC's regulatory oversight and assessment of Bruce Power's overall performance over the first 5 years of its 10-year licence period (October 1, 2018 to September 30, 2028).

CMD 23-M27 [1] addresses the following subjects:

- Licensing updates
- Major Component Replacement
- Elevated hydrogen equivalent concentration in pressure tubes of reactors in extended operation
- Lutetium-177 isotope production
- Bruce Power's Project 2030
- Indigenous engagement activities
- Emergency preparedness

There are no actions requested of the Commission. CMD 23-M27 [1] is for information only.

Résumé

Le présent sommaire fournit à la Commission des renseignements contextuels sur le document à l'intention des commissaires (CMD) 23-M27, *Rapport de mi-parcours au sujet des activités autorisées de Bruce Power* [1].

Le CMD 23-M27 [1] présente à la Commission des renseignements sur la surveillance réglementaire exercée par le personnel de la CCSN et son évaluation du rendement global de Bruce Power pendant les 5 premières années de sa période d'autorisation de 10 ans (du 1^{er} octobre 2018 au 30 septembre 2028).

Le CMD 23-M27 [1] aborde les sujets suivants :

- Mises à jour sur les activités d'autorisation
- Remplacement des composants majeurs
- Concentrations élevées d'hydrogène équivalent dans les tubes de force des réacteurs en exploitation prolongée
- Production d'isotopes de lutécium 177
- Projet 2030 de Bruce Power
- Activités de mobilisation des Autochtones
- Préparation en cas d'urgence

Aucune mesure n'est requise de la Commission. Ce CMD est fourni à titre d'information seulement.

Signed/Signé le

8 June 2023



Digitally signed by Viktorov, Alexandre
DN: C=CA, O=GC, OU=CNSC-CCSN, CN="Viktorov,
Alexandre"
Reason: I am approving this document
Location:
Date: 2023.06.08 10:49:39-04'00"
Foxit PDF Editor Version: 12.1.2

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Directeur général

Direction de la réglementation des centrales nucléaires

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EXECUTIVE SUMMARY

The Canadian Nuclear Safety Commission (CNSC) acknowledges that the Bruce Power site, located in the municipality of Kincardine, Ontario, is within the traditional territory of the Saugeen Ojibway Nation (SON), and the harvesting areas of the Georgian Bay Métis Nation of Ontario (MNO) and the Historic Saugeen Métis (HSM) peoples.

The Commission, as documented in its 2018 Record of Decision [2], renewed Bruce Power's nuclear power reactor operating licence (PROL-18.00/2028) for a 10-year period (from October 1, 2018, to September 30, 2028). In paragraphs 17 and 451 of its decision, the Commission directed Bruce Power to provide a mid-point update on this renewed 10-year licence period, no later than 2023.

In its Record of Decision [2], the Commission recognized that a mid-term report would provide an opportunity for Indigenous Nations and communities, members of the public and stakeholders to take part in proceedings relating to Bruce Power's licensed activities. To further facilitate this engagement and interaction, the Commission expressed that the Commission meeting is to take place in the local community.

The Commission directed Bruce Power to provide a mid-term update, and the focus of this proceeding is understood to be Bruce Power's submission and presentation. CNSC staff are presenting a slide deck (CMD 23-M27 [1]) that provides regulatory context to the topics discussed in Bruce Power's submission and presentation.

Although the Commission's direction was for Bruce Power to provide a mid-term update, CNSC staff's presentation [1] is intended to provide the Commission with a summary of the CNSC's regulatory oversight of Bruce Power's major projects and licensed activities over the past 5 years. As such, CNSC staff are providing a slide deck only for this mid-term update. CNSC staff provide a comprehensive annual update on Bruce Power's regulatory performance in its annual Regulatory Oversight Report (ROR).

This presentation focuses on the higher profile licensed activities conducted by Bruce Power that have shown to be of interest to the Commission, Indigenous Nations and communities, and stakeholders. Specifically, this presentation provides information on how Bruce Power has met licensing requirements in the first half of its licence period, with reference to applicable safety and control area information where required.

The topics covered in the presentation include Major Component Replacement projects, elevated hydrogen equivalent concentration in pressure tubes of reactors in extended operation, lutetium-177 isotope production, Bruce Power's Project 2030, Indigenous engagement activities, and emergency preparedness. In addition, this presentation provides an update on amendments made to Bruce Power's PROL and associated licence conditions handbook over the past 5 years.

Referenced documents in this CMD [1] are available upon request.

REFERENCES

1. CMD 23-M27, CNSC Staff Presentation, Bruce Power Mid-Term Update of Licensed Activities
2. Record of Decision, Application to Renew the Power Reactor Operating Licence for Bruce A and Bruce B Nuclear Generating Stations



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Bruce Power Mid-term Update of Licensed Activities



Commission Meeting
September 20-21, 2023
CMD 23-M27

CNSC Staff Presentation

E-doc #7031459 (pptx)

E-doc #7041364 (pdf)



Executive Summary and Context

- The Commission directed Bruce Power to provide update at mid-point of licence period
- Through this presentation, CNSC staff are providing the regulatory oversight context on some of the topics discussed in Bruce Power's submission and presentation
- CNSC staff provide a comprehensive annual update on Bruce Power's regulatory performance in its annual Regulatory Oversight Report (ROR)
 - The 2022 ROR will be presented to the Commission in December 2023

This mid-term update does not replace the annual ROR; it provides an opportunity for Indigenous Nations and communities, members of the public and stakeholders to take part in proceedings specific to Bruce Power's licensed activities



Outline

- **Licensing Update**
- **Major Component Replacement (MCR)**
- **Elevated H_{eq} Concentration in Pressure Tubes of Reactors in Extended Operation**
- **CNSC Oversight of Other Bruce Power Projects**
- **Indigenous Engagement Activities**
- **Emergency Preparedness**
- **Closing Remarks**
- Appendix A: LCH Updates since 2018 Licence Renewal
- Appendix B: Elevated H_{eq} Concentration in Pressure Tubes References



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LICENSING UPDATE



2018 Licence Renewal

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- The Power Reactor Operating Licence (PROL) for Bruce NGS A and B was **renewed by the Commission for a period of 10 years**
- The licence is valid from October 1, 2018, to **September 30, 2028**
- Licence renewal encompassed Bruce Power's **existing operations**, as well as licensed activities related to the **Major Component Replacement (MCR) project**
 - Started in 2020 at Unit 6
 - Followed in 2023 by Unit 3



Source: Bruce Power

Throughout the current licence period, Bruce Power's regulatory performance has been rated as satisfactory or fully satisfactory in all safety and control areas (SCAs)



PROL Amendments

The Bruce
NGS A and B
Power Reactor
Operating Licence
PROL 18.00/2028
came into effect
on October 1,
2018

PROL Version	Amendment
PROL 18.01/2028 (April 9, 2020)	This PROL amendment was to replace RD-204, Certification of Persons Working at Nuclear Power Plants, with REGDOC-2.2.3, Personnel Certification, Volume III: Certification of Reactor Facility Workers, Version 2 , as per Record of Decision DEC 20-H100.
PROL 18.02/2028 (September 24, 2021)	This PROL amendment was to allow for the production of Lutetium-177 with the addition of Licence Condition 15.10, as per Record of Decision DEC 21-H100.



Integrated Implementation Plan (IIP)

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- The Integrated Implementation Plan (IIP) is the final output of Bruce Power's Periodic Safety Review (PSR)
- Bruce Power has committed to implementing IIP actions with practicable safety improvements identified through the PSR
 - Bruce Power's IIP encompasses 191 total items
 - 58 of the 191 IIP items (30 %) have been completed
 - Many of the remaining IIP items are linked to current, or future Major Component Replacement (MCR) projects, and require their corresponding MCR outage to be completed



Bruce NGS A turbine interior

Bruce Power is
completing its IIP as
required by the PROL



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MAJOR COMPONENT REPLACEMENT (MCR)



CNSC Regulatory Hold Points: Unit 6 MCR

- The PROL includes four Regulatory Hold Points:
 1. Fuel load
 2. Removal of guaranteed shutdown state (GSS)
 3. Increasing above 1% full power
 4. Increasing above 35% full power
- Pre-requisites for each hold point must be met before they are released
 - The authority to release hold points was delegated by the Commission to the CNSC's Executive Vice-President and Chief Regulatory Operations Officer
- Fuel load hold point was removed on May 10, 2023



Training in fuel loading procedures
Source: Bruce Power

CNSC uses regulatory hold points to ensure that licensees meet requirements before conducting certain licensed activities



CNSC Compliance Activities

CNSC staff's Compliance Plan for Unit 6 MCR:

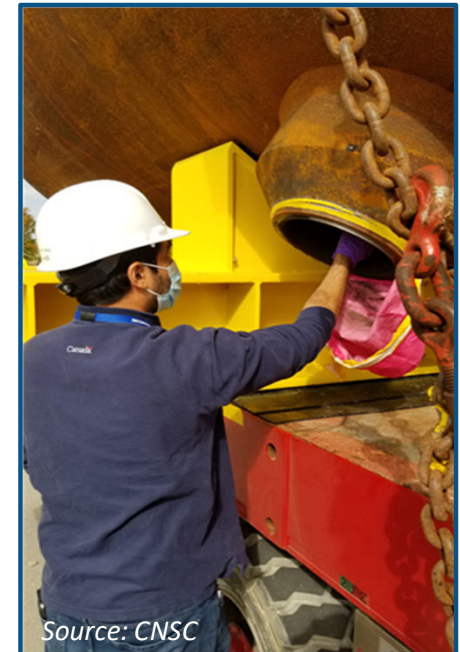
- developed using a risk-informed approach
- captured all safety and control areas (SCAs)
- linked to various unit 6 MCR-related Bruce Power station activities

CNSC staff completed the following compliance activities:

- 25 Type II Inspections
- 67 Field Inspections
- 7 Desktop Inspections

Inspections demonstrated that Bruce Power conducted activities in accordance with requirements

- Unit 3 MCR is progressing on schedule with CNSC staff conducting compliance activities to verify compliance of Bruce Power's work



Source: CNSC

CNSC inspector taking smear samples from steam drum

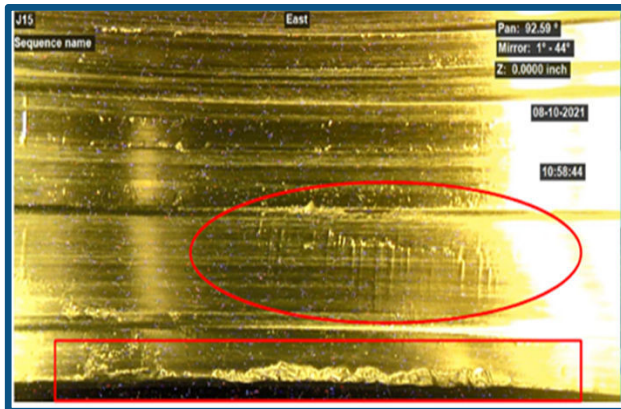
CNSC staff verifies compliance throughout the MCR project



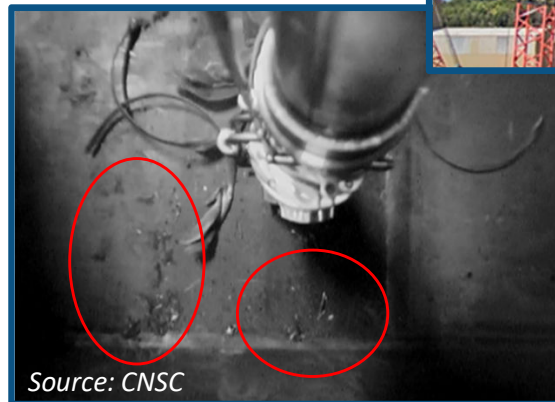
CNSC Oversight: Unit 6 MCR

Areas of focus for CNSC inspections included:

- contractor management
- calandria tube sheet bore (CTSB) remediation
- inadequate control of quarantined items



CTSB with scratches and material build-up
Source: Bruce Power



Source: CNSC

The removal of foreign material from the calandria



Left: Steam generator being removed



Bottom: Fuel channel installation activities

Source for both images above: CNSC



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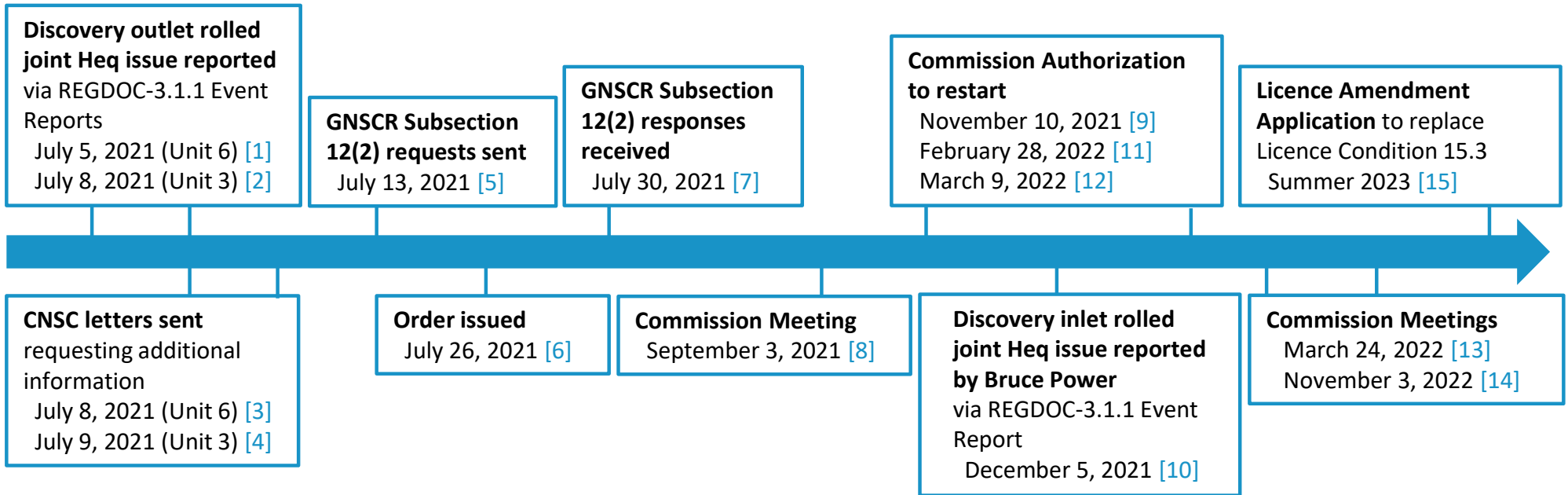
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ELEVATED H_{EQ} CONCENTRATION IN PRESSURE TUBES OF REACTORS IN EXTENDED OPERATION



Timeline of Events: Elevated H_{eq} Concentration in Pressure Tubes



References can be found in Appendix B



Corrective Actions: Elevated H_{eq} Concentration in Pressure Tubes

To address the findings at the rolled joints, Bruce Power has:

- undertaken additional material surveillance and scrape campaigns
- introduced operational changes and training for operators
- undertaken research and development (R&D) activities

CNSC compliance verification activities have demonstrated that Bruce Power pressure tubes remain fit for service



CNSC Staff Update: Elevated H_{eq} Concentration in Pressure Tubes

- Based on previous Commission decisions, the CNSC is satisfied that the continued operation of Bruce Power's reactors does not pose unreasonable risk
 - existing safety analyses remain valid
 - CNSC staff continue to engage with Bruce Power on the key issues
- Next detailed update to the Commission will be presented in December 2023 during the Commission meeting for the 2022 NPP ROR

Risk-informed decision making has demonstrated that Bruce Power's pressure tubes remain fit for service and safe for operation



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CNSC OVERSIGHT OF OTHER BRUCE POWER PROJECTS



Lutetium-177 Isotope Production



IPS Target Interface Skid (TIS)
Source: CNSC

- **October 2019** - CNSC staff were informed of Bruce Power's intent to produce Lu-177
- **November 2020** - Bruce Power submitted an application requesting to amend the PROL to produce Lu-177
- **April 2021** - CNSC staff submitted CMD 21-H100 recommending Commission amends the PROL, with a Regulatory Hold Point prior to Bruce Power commencing commercial production of Lu-177
- **September 2021** - The Commission amended Bruce Power's PROL
- **October 2022** - CNSC staff administered the release of the hold point allowing Bruce Power to begin commercial production of Lu-177

CNSC staff performed compliance verification activities throughout Bruce Power's Lu-177 project



Bruce Power's Project 2030

- CNSC staff are conducting regulatory reviews of Bruce Power's submissions for Project 2030
- Bruce Power will require an amendment of its licence by the Commission in order to recover the original reactor, channel and bundle power limits at the Bruce NGS A and B, as proposed by its Project 2030



Source: CNSC



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INDIGENOUS ENGAGEMENT ACTIVITIES



Indigenous Engagement Activities

- CNSC staff conduct oversight of Bruce Power's engagement and communication efforts with the SON, HSM, and MNO Region 7, and are satisfied with Bruce Power's efforts and engagement program
- Since 2018, CNSC staff have continued to build their relationships with the Saugeen Ojibway Nation (SON), Historic Saugeen Métis (HSM) and Métis Nation of Ontario (MNO) Region 7
- The CNSC's Participant Funding Program (PFP) provided funding to support the development and implementation of Terms of References and work plans with the SON, HSM, and MNO Region 7

CNSC staff are committed to building relationships and trust with Indigenous Nations and communities



Saugeen Ojibway Nation (SON)



CNSC staff with SON at local community events
Source of all images: CNSC

- Terms of Reference signed in May 2019
- Meetings with CNSC staff:
 - Monthly with SON environment office
 - Three times per year with SON steering committee
- Detailed work plan developed that includes:
 - Collaboration on environmental reviews
 - Participation in IEMP
 - Mitigation measures study
 - Sharing of information from CNSC inspections
 - Outreach and mutual learning



Historic Saugeen Métis (HSM)

- Terms of Reference signed in March 2019
- Meetings with CNSC staff occur twice per year, or more as needed
- HSM participated in the CNSC's Independent Environmental Monitoring Program (IEMP) sampling campaigns in the Bruce region, most recently in 2022
- CNSC staff and HSM collaborate on annual engagement updates for the annual Regulatory Oversight Report (ROR)
- Open learning sessions / webinars



Heritage walk with HSM at MacGregor Point
Provincial Park
Source: CNSC



Métis Nation of Ontario Region 7 (MNO)

- Terms of Reference signed in December 2019
- Meetings with CNSC staff twice per year, or more as needed
- Region 7 work plan developed
- MNO participated in IEMP sampling campaigns in the Bruce region, most recently in July 2022
- CNSC staff and MNO collaborate on annual engagement updates for the annual ROR



Members of Georgian Bay Traditional Territory Consultation Committee (GBTTC)

Source: CNSC



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EMERGENCY PREPAREDNESS



Full-Scale Emergency Exercises (1/2)



Source: Bruce
Power



Source: Owen Sound Sun Times

Bruce Power Emergency Management
Centre (EMC)

- Bruce Power executed two full-scale emergency exercises at Bruce A and B NGS:
 - Huron Resilience (October 2019)
 - Huron Endeavor (October 2022)
- The exercises lasted three days and involved municipal, provincial and federal agencies
- CNSC staff conducted compliance activities during the exercises

CNSC staff concluded that Bruce Power demonstrated the ability to adequately respond to an emergency while ensuring the safety and protection of on-site personnel, the public and the environment



Full-Scale Emergency Exercises (2/2)

CNSC staff:

- Participated in the Bruce Power full-scale exercises in 2019 and 2022
- Established exercise objectives that assessed the CNSC Emergency Operations Centre (EOC)'s ability to effectively respond to a nuclear emergency

CNSC staff's response during the exercises demonstrated that CNSC was able to fulfill the dual role of:

- Maintaining regulatory oversight of licensee nuclear emergency activities
- Participating in Canada's whole-of-government response to a nuclear emergency



Source: CNSC

CNSC Emergency Operations Centre (EOC)



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CLOSING REMARKS



Closing Remarks

- Throughout the first half of this licence period, CNSC oversight has shown that:
 - Bruce Power's safety performance has remained stable, and Bruce Power has conducted licensed activities in accordance with regulatory requirements, including communication under the Public Information and Disclosure Program
 - Bruce Power's engagement and communication efforts with the SON, HSM, and MNO Region 7 have met CNSC staff's expectations
 - Bruce Power has continued to protect the health and safety of the public and the environment near the Bruce NGS
- CNSC staff will continue its engagement activities to build trust and relationships with Indigenous Nations and communities in the vicinity of the Bruce NGS



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Appendix A: LCH Updates since 2018 Licence Renewal (1/2)

LCH Revision	Updates
<p>Revision 1: LCH-PR-18.00/2028-R001 (April 1, 2019)</p>	<ul style="list-style-type: none"> No significant changes made to Compliance Verification Criteria (CVC) or Guidance documents. Minor clarifications to text and editorial changes made.
<p>Revision 2: LCH-PR-18.01/2028-R002 (May 25, 2020)</p>	<ul style="list-style-type: none"> The following documents became CVC: <ul style="list-style-type: none"> REGDOC-2.1.2, <i>Safety Culture</i> <ul style="list-style-type: none"> REGDOC-2.12.1, <i>High-Security Facilities, Vol. I: Nuclear Response Force, Version 2</i> REGDOC-2.2.4, <i>Fitness for Duty, Vol. III: Nuclear Security Officer Medical, Physical, and Psychological Fitness</i> REGDOC-2.2.3, <i>Personnel Certification, Volume III: Certification of Reactor Facility Workers, Version 2 (Superseded RD-204)</i> The following documents became Guidance: <ul style="list-style-type: none"> REGDOC-2.2.1, <i>Human Factors</i> REGDOC-2.5.1, <i>General Design Considerations: Human Factors</i> REGDOC-2.2.5, <i>Minimum Shift Complement</i> REGDOC-2.1.1, <i>Management System</i> REGDOC-2.8.1, <i>Conventional Health and Safety</i> CSA N292.1-16, <i>Wet storage of irradiated fuel and other radioactive materials</i> CSA N290.9-19, <i>Reliability and maintenance programs for nuclear power plants</i> Updated text in Section 10.1 for automated data sharing during a nuclear emergency



Appendix A: LCH Updates since 2018 Licence Renewal (2/2)

LCH Revision	Updates
<p>Revision 3: LCH-PR-18.02/2028-R003 (September 28, 2021)</p>	<ul style="list-style-type: none"> • Licence Condition 15.10 was added to allow for the production of Lutetium-177. • The following documents became CVC: <ul style="list-style-type: none"> • REGDOC-3.2.1, <i>Public Information and Disclosure</i> • REGDOC-2.12.1, <i>High-Security Facilities, Vol. II: Criteria for Nuclear Security Systems and Devices</i> • CSA N288.8-17, <i>Establishing and implementing action levels for releases to the environment from nuclear facilities</i> • The following documents became Guidance: <ul style="list-style-type: none"> • REGDOC-2.12.3, <i>Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material, Version 2.1</i> • REGDOC-2.14.1, <i>Packaging and Transport: Information Incorporated by reference in Canada’s Packaging and Transport of Nuclear Substances Regulations, 2015, Volume I, Version 2</i> • REGDOC-2.7.1, <i>Radiation Protection</i> • REGDOC-2.7.2, <i>Ascertaining Occupational Dose, Volume I</i> • CSA N288.9-18, <i>Guideline for design of fish impingement and entrainment programs at nuclear facilities</i> • CSA N293-12, <i>Fire protection for nuclear power plants</i> • IAEA Nuclear Security Series No. 33-T, Technical Guidance, “Computer Security of Instrumentation and Control Systems at Nuclear Facilities” for developing and maintaining a cyber security program • Updated text in Section 6.1 related to current status of pressure tube fracture toughness assessments, and fracture toughness model



Appendix B: Elevated H_{eq} Concentration in Pressure Tubes References (1/2)

- [1] Bruce Power Detailed Event Report, “REGDOC-3.1.1 Report B-2021-98077 DR – Pressure Tube Surveillance Hydrogen Equivalent Concentration measurements on unit Shutdown for Major Component Replacement”, June 30, 2021, e-Doc 6601668 (CMD 21-M37.1).
- [2] Bruce Power Detailed Event Report, “REGDOC-3.1.1 Report B-2021-93819 DR – A2131 Outage Scrape Campaign Hydrogen Equivalent Concentration Measurements”, June 15, 2021, e-Doc 6597908 (CMD 21-M37.1)
- [3] CNSC Letter, L. Sigouin to M. Burton, “Bruce A and B: CNSC Review of REGDOC-3.1.1 Event Report B-2021-98077 DR on Pressure Tube Surveillance Hydrogen Equivalent Concentration Measurements on Unit Shutdown for Major Component Replacement – New Action Item 2021-07-23406”, July 8, 2021, e-Doc 6600766 (CMD 21-M37.A)
- [4] CNSC Letter, L. Sigouin to M. Burton, “Bruce A: CNSC Review of REGDOC-3.1.1 Event Report B-2021-93819 on A2131 Outage Scrape Campaign Hydrogen Equivalent Concentration Measurements – New Action Item 2021-07-23424”, July 9, 2021, e-Doc 6603183 (CMD 21-M37.A)
- [5] CNSC Letter, A. Viktorov to M. Burton, “Bruce A and B: Request pursuant to Subsection 12(2) of the General Nuclear Safety and Control Regulations: Issues Relating to Measurement of Hydrogen Equivalent Concentration in Pressure Tubes”, July 13, 2021, e-Doc 6603948 (EN, FR)
- [6] Designated Officer Order, R. Jammal to Bruce Power, “Order by a Designated Officer Under Paragraph 37(2)(f) and Subsection 35(1) of the Nuclear Safety and Control Act”, July 26, 2021, e-Doc 6612405 (EN, FR)
- [7] Bruce Power Letter, M. Burton to M. Leblanc and A. Viktorov, “Bruce A and B: Response to Subsection 12(2) of the General Nuclear Safety and Control Regulations: Measurement of Hydrogen Equivalent Concentration in Pressure Tubes”, July 30, 2021, BP-CORR-00531-01884, e-Doc 6616619 (CMD 21- M37.1)
- [8] CMD 21-M37, “Presentation – Impact on NPPs of Bruce Unit 3 and 6 Licence Limit Exceedance of Hydrogen Equivalent Concentration in Pressure Tubes”, September 3, 2021, e-Doc 6626961



Appendix B: Elevated H_{eq} Concentration in Pressure Tubes References (2/2)

- [9] Record of Decision, DEC 21-H110, "In the Matter of Bruce Power Inc. – Request for Authorization to Restart Bruce Nuclear Generating Station A Unit 3 following its current planned outage", November 10, 2021, e-Doc 6672394
- [10] Bruce Power Detailed Event Report, "REGDOC-3.1.1 Report B-2021-135624 DR – Industry Pressure Tube (PT) Surveillance Program – Inlet Hydrogen Equivalent Concentration Measurements on PT from Unit Shutdown for Major Component Replacement", November 19, 2021, e-Doc 6699742 (CMD 22-M16).
- [11] Record of Decision, DEC 21-H113, "In the Matter of Bruce Power Inc. – Request for Authorization to Restart Bruce Nuclear Generating Station A Unit 4 and Bruce NGS B Units 5, 7 and 8 following future outages", February 28, 2022, e-Doc 6746710
- [12] Record of Decision, DEC 22-H100, "In the Matter of Bruce Power Inc. – Request for Authorization to Restart Bruce Nuclear Generating Station A Unit 3 following future outages", March 9, 2022, e-Doc 6752596
- [13] CMD 22-M16, "Event Initial Report – Bruce Power - Elevated Hydrogen Equivalent Concentration (Heq) in the Inlet Rolled Joint of a Bruce Pressure Tube Removed from Service", March 11, 2022, e-Doc 6754276
- [14] CMD 22-M37, "CNSC staff update on elevated hydrogen equivalent concentration discovery events in the pressure tubes of reactors in extended operation", August 22, 2022, e-Doc 6848197
- [15] Record of Decision, DEC 23-H103, Summer 2023